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ORTEC FINANCE

Insurance Risk Management:

Market Consistent Valuation

ORTEC FINANCE

Market Consistent Valuation

Risk Management Solutions for Insurers

The International Financial Reporting Standards (IFRS) offer the possibility to include (parts of) the market value of insurance liabilities on the balance sheet. Within the framework of Market-Consistent Embedded Value (MCEV) or liability adequacy testing (LAT) the market value of insurance liabilities has to be determined as well. Identifying and then correctly valuing such liabilities, including all guarantees and embedded options, can be complex since most of these options cannot be purchased in the open market. This means that no market price is readily available for them. Nonetheless, an exact valuation is crucial, for example for reporting purposes (e.g. quarterly and annual reports), solvency tests and pricing

Valuation of embedded options

Ortec Finance's Asset Liability Management (ALM) model for insurers features an advanced Monte Carlo module which can provide an exact valuation for even the most complex types of embedded options. In order to obtain such a market-consistent valuation, the model is first calibrated on relevant market data, such as the interest rate curve and market prices of traded instruments (e.g. swaptions or stock options).

After the model has been calibrated properly, it generates (risk neutral) scenarios which lay the groundwork for the upcoming valuation. Having generated these risk neutral scenarios, they can be used to simulate the payoffs of the embedded options over time. The time span of this simulation depends on the time to maturity of the embedded options in the underlying contracts. In principle one has to consider every payoff in order to obtain a reliable valuation.

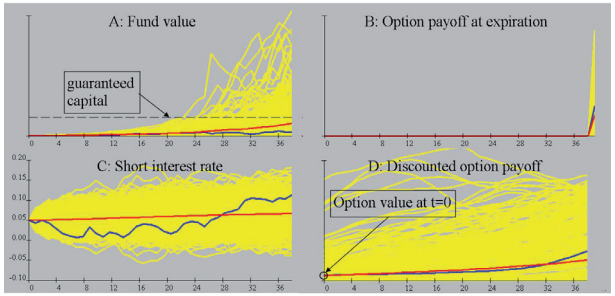
Given these simulated payoffs it is possible to discount these payoffs for each scenario back to the current point in time (along the path of the short interest rate). By calculating the average present value over a large number of scenarios a precise valuation of the option is then found. Variance reduction techniques can also be used to improve the calculation speed.

Technique

An example of the Monte Carlo valuation technique is given in the figure below. We here consider a unit linked investment contract with a guarantee at the expiration date. The policy holder periodically invests premiums in a stock fund. The policy expires after 40 years and the insurer has guaranteed a minimum capital. For the selected (blue) scenario the stock fund has reached a very low level after 40 years (see Panel A). As a result, the value of the investments is lower than the guaranteed capital. This means that the guarantee option pays out for the policy holder (see Panel B). This payoff is then discounted back along the path of the short interest rate (see Panel C and D). The same calculation is performed for each of the 5,000 scenarios. The present value of the embedded option is then found by averaging all discounted option payoffs at the current moment in time (as depicted in Panel D). Note that the average discounted payoff is indicated here with the red line.

Applications

This Monte Carlo technique can be used to value all kinds of embedded options, like profit sharing options, guarantees in insured pension contracts, guaranteed annuity options, surrender options, etcetera. Apart from the valuation of European-style options (which only generate a payoff at one future point in time), it is also possible to value American-style options (which can be exercised at different points in time). The Monte Carlo valuation tool in Ortec Finance's ALM model thus provides the user with almost unlimited flexibility if it comes to the precise valuation of all kinds of embedded options.



Example of a Monte Carlo valuation of a unit linked guarantee.